portant advances which have been made in the study of evolution since the time of Darwin, namely the theories of Weismann and Mendel.

For whether one accepts or rejects these theories, no one will question their great value in stimulating research concerning evolutionary problems, the productiveness of which has been enormous in the last thirty years.

It was in the early eighties that Weismann in his essays on heredity challenged the general belief in the inheritance of acquired characters and pointed out the logical distinction between soma and germ-plasm, which despite numberless attacks still stands. Ten years later "The Germ-plasm" theory was published in its fully developed form, and after another decade of debate and study "The Evolution Theory" was published, in which Weismann attempted to make a comprehensive survey of the entire field of evolution as seen in the light of his germ-plasm theory. In the first sentence of his preface, as translated by Thomson, he says: "When a life of pleasant labor is drawing to a close, the wish naturally asserts itself to gather together the main results, and to combine them in a well-defined and harmonious picture which may be left as a legacy to succeeding generations." Succeeding generations have reason to be grateful to Weismann that he undertook thus to present his mature views. Few books on evolution since the publication of Darwin's "Origin of Species" can be read with greater pleasure or profit than this, or are likely longer to survive. To English readers it is accessible in a faithful translation made by Professor and Mrs. J. A. Thomson in their usual clear and graceful style.

The popularity of the original is shown by the fact that a second edition was called for within two years, the third and doubtless final edition being the one before us. In the second edition few changes were made, beyond the addition of a few notes, but by the time the third edition was issued (1913) Mendelism had so far developed as to call for extended review. Weismann welcomes Mendelism as a confirmation of the basic idea of his germ-plasm theory, the doctrine of determiners. Mutation he rejects as inconsistent with the view that adaptations arise gradually through the action of natural selection.

Bateson's book, first published in 1909, may be regarded as the authoritative interpretation of Mendelism. It contains a biography and three portraits of Mendel with a translation of his original papers, and also a comprehensive account of Mendelian principles as developed by the Bateson-Punnett group of workers at Cambridge University. The first edition of the book was exhausted within a few months of its publication and it was then reprinted without change. The present "third impression" was taken advantage of to add "a series of brief appendices to acquaint the reader with the nature of the principal advances made, while awaiting an opportunity of rewriting the book." The "appendices" mentioned consist of brief notices of subsequent publications, which, however, fail to give an adequate notion of their content, or of the direction which the further development of Mendelism has taken since 1909. The book is rightly and honestly called a "third impression," not a new edition. It is essentially a portrait of the Mendelism of 1909, and seeks to combine the fundamental idea in the germ-plasm theory (that of determiners) with the fundamental idea in mutation (that of the sudden origin of characters).

W. E. Castle

SPECIAL ARTICLES

A NEW METHOD FOR THE DETERMINATION OF SOIL ACIDITY [1]

Soil acidity problems are at the present time, perhaps, the most important of all soil problems confronting the farmers of Wisconsin and many other states. In studying these problems one of the most serious drawbacks has been the lack of suitable qualitative and quantitative methods for the determination of this acidity. The litmus-paper test when properly made is a fairly satisfactory qualitative test and has been our most reliable test.

[1] Publication authorized by the Director of the Wis. Expt. Station.

However, carbonic acid reacts acid to litmus, and, contrary to general belief, the reddening of litmus paper when put into carbonated water for several minutes is permanent even on drying. In testing fresh soil it is therefore necessary to keep all living plant roots away from the paper, as they may turn it red, due to the excretion of carbon dioxide. The soil water may be highly enough charged with carbon dioxide to affect the test. The moist hand must also not come in contact with the litmus paper, for that may redden the paper. When a soil is only slightly acid the litmus test is not sharp and positive and thus often causes confusion.

With a view of securing a more reliable test the writer has evolved the following zinc sulfide method. It was found that acid soils when boiled with zinc sulfide and water would liberate hydrogen sulfide, which, as is well known, can be detected very easily and positively with lead acetate paper. With this as a basis, the following method was worked out:

Ten grams of soil are placed in a 300 c.c. Erlenmeyer flask and to this is added 1 gr. calcium chloride, 0.1 gr. of zinc sulfide, and 100 c.c. water. This is thoroughly shaken and then heated over a flame. After the contents have boiled one minute, a strip of moistened lead acetate paper is placed over the mouth of the flask and the boiling continued two minutes more, when the paper is removed. If the soil is acid the paper will be darkened on the under side in proportion to the degree of acidity. If it is non-acid, no darkening will occur *if the test has been performed as just outlined.*

The calcium chloride is added to make the test more sensitive. It reacts with the comparatively insoluble soil acids and forms a small amount of hydrochloric acid which readily liberates hydrogen sulfide from zinc sulfide. The mixture is boiled one minute before putting the test paper in place in order to expel most of the carbon dioxide and also to more nearly bring all tests to the same condition before applying the paper. This test will positively detect smaller amounts of soil acids than the litmus test. The range of colors, showing degree of acidity, is large, being from white to black.

At first thought it seems possible that on boiling soils with water, some which had undergone anaerobic fermentation might give off appreciable amounts of hydrogen sulfide and thus confuse the test. On careful consideration this appears very improbable, for if the soil is alkaline any hydrogen sulfide formed in the process of fermentation will combine with the excess of bases present and is thus not given off in the test. Fresh peat and muck soils, some of which had lately been inundated, were tested and in no cases did the alkaline ones give a coloration to the test paper. The test has been applied to a considerable number of soils and also other materials of known reaction and as yet not a single objection to the test has arisen.

As a quantitative method, an effort is being made to measure the degree of acidity by titrating with standard iodine solution the hydrogen sulfide which a soil will liberate. Whether this will work with all soils has as yet not been determined. By using this test for the end point in the Veitch lime water method for acidity or lime requirements, the present Veitch method is considerably shortened and made far more accurate.

The most important part of the test, however, is the fact that it can be made approximately quantitative, and still require only very simple apparatus—such as can be carried right into the field, and require no more than ten to fifteen minutes for the determination. This will make it of great value to the extension man, field agent, etc. In fact, the farmer himself will be able to determine the lime requirements of his soil, by following very simple directions. The principle of this quantitative method depends upon the fact that for any particular class of soils the degree of acidity is closely proportional to the intensity of color produced on the paper when the test is conducted as previously outlined. The color on the test paper needs only to be compared to a standard color scale and from an accompanying table the degree of acidity or lime requirements is read off directly. This standard color

scale is now being prepared and checked up with standard soil acids made by new methods.

E. TRUOG

DEPARTMENT OF SOILS,
WISCONSIN EXPERIMENT STATION,
UNIVERSITY OF WISCONSIN

EXPERIMENTAL EFFORTS TO RETAIN THE FRESHNESS IN CUT ROSE BLOOMS[1]

DURING the spring of 1908 the Rhode Island Station had a large surplus of rose blooms from its experimental beds, and at the suggestion of Dr. H. J. Wheeler, who was then director of the station, the writer carried on over one hundred and fifty tests with solutions of various kinds of chemicals and in various concentrations, to ascertain their effect in promoting the keeping qualities of the cut blooms, whereby the average housewife could with slight trouble and expense prolong materially the period of freshness of the blooms; thus increasing largely the usefulness of the rose as a home decoration.

Most of the tests were made in May, 1908, while the final tests were completed in July, 1913.

The varieties of rose blooms used in 1908 were Brides and Bridesmaids, while the Maryland was used in 1913.

In most cases the blooms were taken immediately after being cut, and divided into uniform groups of six to eight. The stems were cut from 7 to 10 inches long, and placed in wide-mouthed flasks of 500 c.c. capacity. Ordinary water was used as the solvent in all of the tests, and a control flask was included with each lot of blooms, all of which were kept under laboratory conditions and in the original solutions for periods of from four to seven days. The number of tests of a given concentration of a chemical varied from one with the extremes to as high as three or four with some of the medium dilutions.

In the following table the degrees of concentration of the solutions are divided into the lowest used, the highest used which was not injurious, and those used which proved injurious.

[1] Contribution 205 from the Agricultural Experiment Station of the Rhode Island State College, Kingston.

PARTS IN 10,000

	Smallest Number of Parts Used	Largest Number of Parts Not Injurious	No. of Parts Used that Proved Injurious
Alcohol	—	—	50–200
Ammonium hydroxid	50	100	700–1,000
Borax	1	5	20–250
Boric acid	2	5	10
Carbolic acid	—	—	2–100
Ether	—	30	50–500
Formalin	—	—	10–200
Glycerine	—	—	50–100
Iron, solid, powdered	—	10	—
Magnesium sulfate	—	1	100
Nutrient solution[2]	5	10	—
Potassium nitrate	1	10	25
Potassium permanganate	0.2	2.5	10
Sodium carbonate	—	5	20
Sodium chlorid	1	10	100–250
Sodium nitrate	1	10	—
Sodium sulfate	—	—	2–5
Sodium sulfite	2	5	10–50
Sugar	10	1,000	—
Sulfuric acid	—	30	50–150

A mixture of one part of carbolic acid and three parts ammonium hydroxid in 10,000 did not prove injurious, while two parts carbolic acid and 50 parts ammonium hydroxid did prove injurious.

Of all the tests, a strong sugar solution, 7–10 per cent., was the only one that caused any marked freshening in the appearance of the blooms. This effect was shown by a deepening of the color of the pink varieties within a few hours after the stems were placed in the sugar solution, whereas those in water faded much sooner. However, the breaking down of the blooms and the dropping of their petals occurred at the same time in the flasks containing sugar as in those containing only water.

When clean flasks were used, the changing of the water daily, or the cutting off of the end of the stems and changing the water daily did not prolong the keeping qualities of the blooms.

F. R. PEMBER

RHODE ISLAND EXPERIMENT STATION

[2] Contained 20 c.c. .1 N $Ca(NO_3)_2$, 10 c.c. .1 N NH_4NO_3, 8 c.c. .1 N KCl, 8 c.c. .1 N $CaH_4(PO_4)_2$, 16 c.c. .1 N $MgSO_4$ and 10 c.c. .001 N $Fe_2(NO_3)_6$ per L.